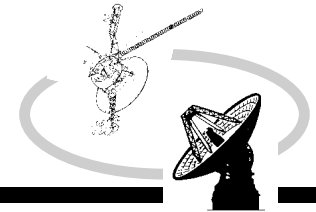


TMO Technology Program Overview

Peter Shames

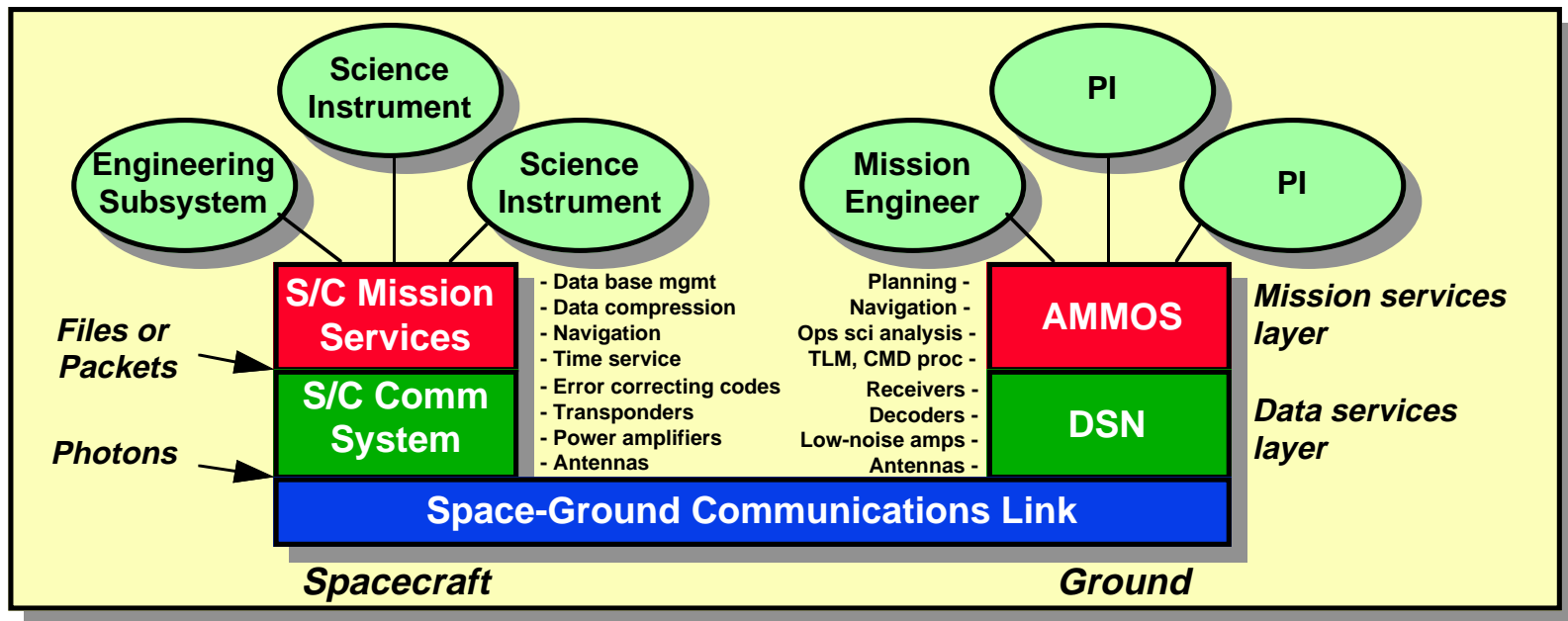
January 15, 1998

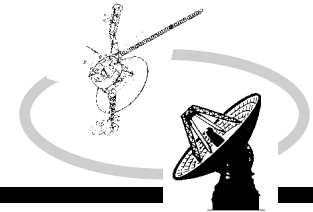


TMOD's New Role

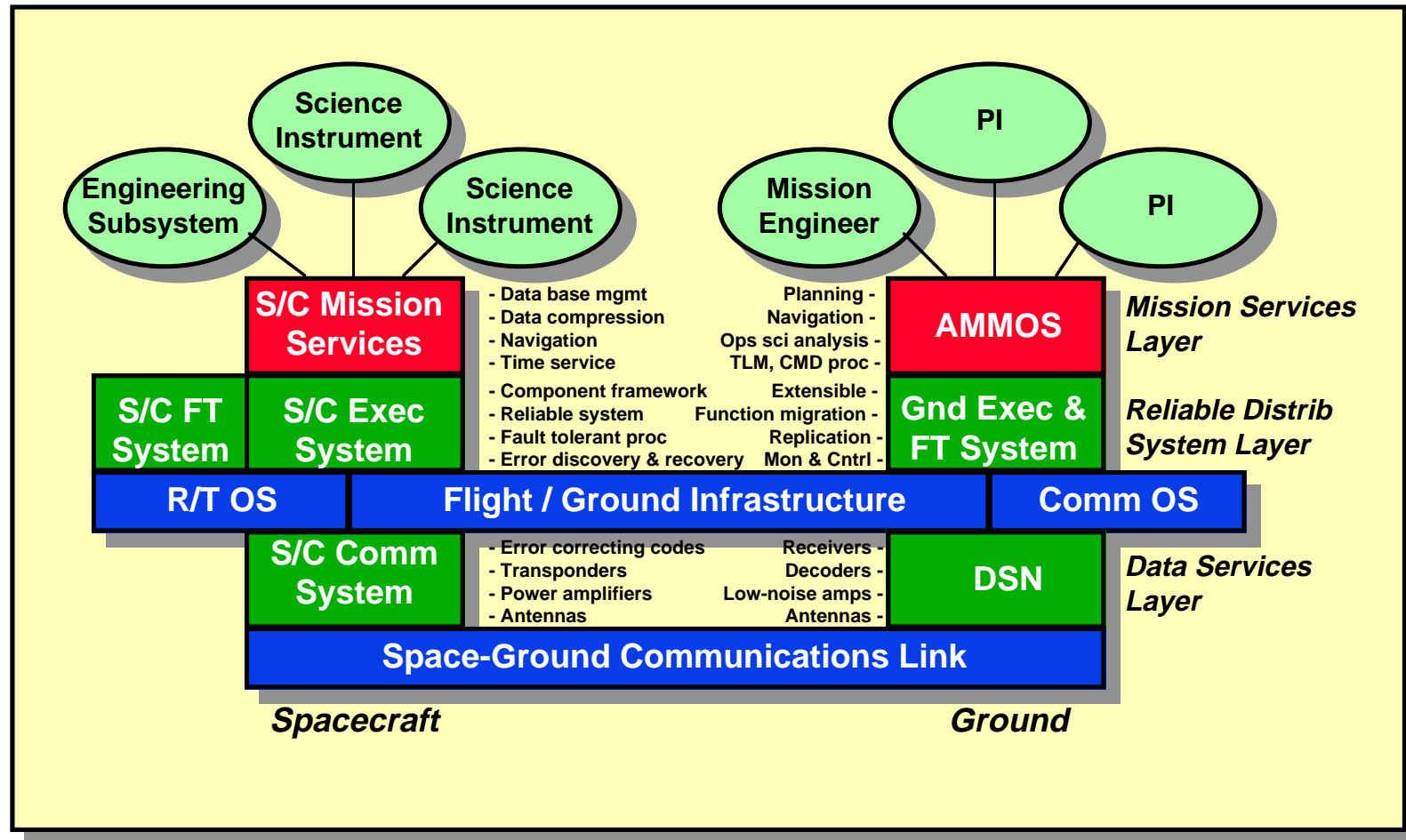


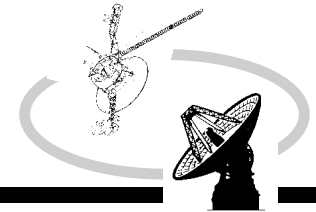
- TMOD is becoming responsible for delivering end-to-end services, e.g.
 - Before - TMOD caught bits from the sky and delivered to users
 - After - TMOD moves information from science instruments to PI
- TMOD will have responsibility for delivering new TMO capabilities, e.g.
 - Before - TMOD modified DSN to match each new mission
 - After - TMOD delivers flight and ground systems that work together
- TMOD will assure the set of missions can be operated at a reasonable cost





Architecture Showing Flight / Ground Elements

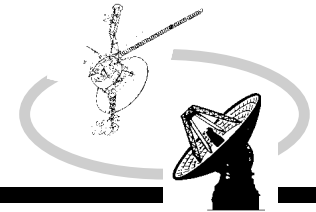




And What Does TMOT Do?



- **Manage the program, select project tasks, coordinate related activities, facilitate collaborations and working arrangements**
- **Keep abreast of current technical developments, so that we are making the right strategic decisions spending our budgets**
- **Lobby with the rest of TMOD, flight programs & projects, TAP, SESPD, technical divisions, for alignment to this strategic vision**
- **Interface, Interface, Interface**
 - **SOMO**
 - **NASA Headquarters**
 - **Technical Divisions**
 - **Lab Management**
 - **CSOC**
 - **X2000**
 - **TMOD**
 - **Program office people**
 - **Workers at the stations, AMMOS, etc.**
 - **Other Program Offices**
- **We need to know what you are doing, how things are going, who you are working with, in order to do this as successfully as possible**



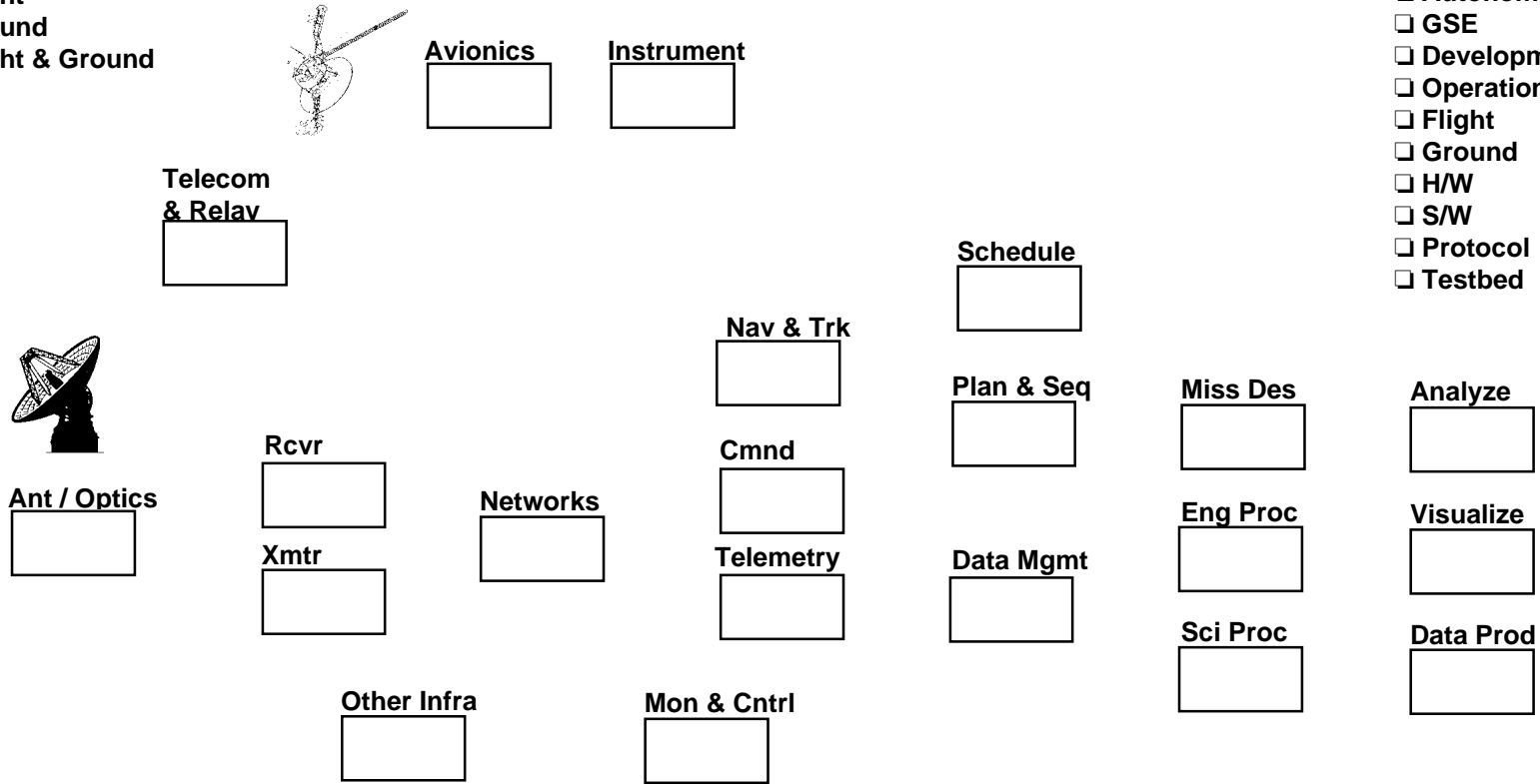
The “Big” Picture



By filling boxes (using codes below), show graphically how your work area/unit fits into this high level view of the overall TMOD environment, name the elements of the end to end system you are working on and what layers in these functions you contribute to.

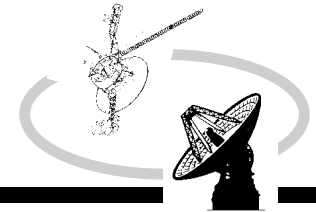
Fill Codes:

- ☐ Flight
- ☐ Ground
- ☐ Flight & Ground



Check all that apply:

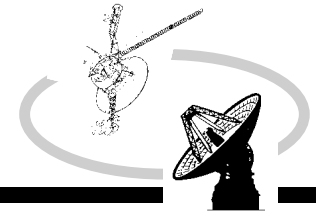
- ☐ Automation
- ☐ Autonomy
- ☐ GSE
- ☐ Development
- ☐ Operations
- ☐ Flight
- ☐ Ground
- ☐ H/W
- ☐ S/W
- ☐ Protocol
- ☐ Testbed



TMOT Data Services Work Areas

Data Services Work Areas - Laif Swanson

- **Antenna Systems - David Rochblatt**
- **Atmospheric Propagation - George Resch**
- **Communication Systems Analysis - Fabrizio Pollara**
- **DSS13 - Larry Teitelbaum**
- **DS-T - Nasser Golshan**
- **Frequency & Timing - John Dick**
- **In Situ Communication - Stan Butman**
- **Ka-Band Experiment - Shervin Shambayati**
- **Low Noise Systems - Javier Bautista**
- **Network Signal Processing - Tsun-Yee Yan**
- **Optical Communication - Jim Lesh**
- **S/C Radio - Jonathan Perret**



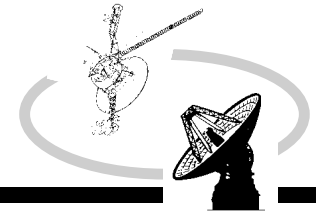
TMOT Mission Services Work Areas

Mission Services TMOT Work Areas - Peter Shames

- **Unified Flight / Ground Architecture (coordinated with X2000 working group)**
- **Navigation - Al Cangahuala**
- **Radiometric Tracking & GPS - Steve Lichten**
- **Science Processing & Visualization - Tom Handley**
- **TMOD Automation - John Leflang**
- **Beacon Mode Operations - Jay Wyatt**
- **Integrated Mission Support - Chet Borden**
- **Protocols & Standards - Adrian Hooke**

Mission Services CIP SSMs

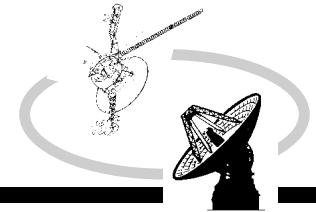
- **Common Services & Protocols - Dean Hardi**
- **Mission Services & Applications - Ralph Reichert, Bob Wilson**
- **Navigation & Tracking - Chris Christensen, Pieter Kallemeyn**
- **Science Instrument Services - Tom Handley**
- **Telecomm & Command - Sooz Kurtik**



Main Themes for TMOT/CIP Work Areas



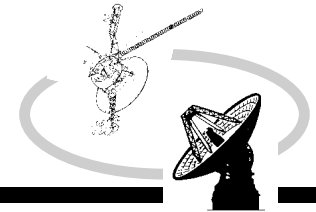
- **Improve system performance while reducing end-to-end costs**
- **Improve communications data rates and reliability**
 - Ka band, inflatable antennas, low noise receivers
 - optical communication
 - turbo codes, compression
 - frequency & timing standards, calibration
- **Support services architecture implementation**
 - service request generation and handling
 - integrated resource planning and forecasting tools
 - improve automation of GPS and OD operations
- **Improve automation and ease of use of TMOD operations**
 - automated activity execution and replanning
 - automated command and file delivery
 - fault detection, isolation, and recovery
 - improved monitoring of system performance



Main Themes, contd



- **Develop and demonstrate new ground and S/C technologies**
 - DS-T, other network simplification prototyping
 - S/C Transponding Modem (STM), timing standard
 - micro-GPS, formation flying, GPS-like navigation at other planets
 - beacon mode communications and demand access
 - new in situ communication, relay, and file transfer protocols
 - multiple S/C, libration point planning tools
- **Support development of integrated flight / ground architecture**
 - unified flight/ground architecture being worked with X2000
 - S/C verification lab
 - migratable components for navigation, planning, data compression, communication, data transfer
- **Prototype autonomous capabilities for S/C integration**
 - navigation, close proximity maneuvers, formation flying
 - planning
- **Demonstrate new science planning, visualization, and analysis tools**
 - interferometry processing
 - immersive environments, sense of presence, virtual reality HDTV
 - robotics planning and in-situ visualization



Work Units Potentially Relevant to XXXX



- **GPS-like tracking using GPS-on-a-Chip**
- **Autonomous Formation Flying**
- **GPS navigation for fully autonomous spacecraft**
- **Autonomous maneuver optimization**
- **ARTSN - next generation navigation system**
- **Multiple spacecraft mission analysis**
- **JIT sequence planning**
- **Unified flight / ground architecture**
- **Beacon mode signal detection and processing**
- **BEAM fault detection and isolation tools**
- **NiFTP protocol development**
- **Mission planning tools integrated with Service Request processing**
- **Source coding for data compression**
- **Automated command delivery**